



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|-------------------------|---------------------|------------------|
| 09/914,293 | 11/06/2001 | Yuji Fujimori, Suwa-Shi | 110443 | 4030 |

7590

03/19/2003

Oliff & Berridge
PO Box 19928
Alexandria, VA 22320

EXAMINER

TRAN, TAN N

| ART UNIT | PAPER NUMBER |
|----------|--------------|
|----------|--------------|

2826

DATE MAILED: 03/19/2003

15

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/914,293

Applicant(s)

FUJIMORI ET AL.

Examiner

TAN N TRAN

Art Unit

2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on amendment filed on 02/19/03.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) 26,27 and 29 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8,10,14-22,25,28 and 30 is/are rejected.
- 7) ☒ Claim(s) 11-13,23 and 24 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

1. Applicant's communication filed on 02/19/03 has been carefully considered by the examiner. The arguments advanced therein are persuasive with respect to the rejections of record and those rejections are accordingly withdrawn. In view of a further search, however, a new rejection is set forth further below. This action is not made final.

Election/Restriction

2. Applicant's election with traverse of Group I, claims 1-24 in Paper No. 12 is acknowledge. The traversal is on the ground(s) that "this application is a national stage application based on an international PCT application. Restriction practice under 35 U.S.C. 121, as it applies to national stage application submitted under 35 U.S.C 1.11(a), is not applicable to either international or national stage applications. National stage applications based on international PCT application must be examined under unity of invention requirements of the PCT as set forth in 37 C.F.R 1.475 and 1.499" and applicant's traverse about restriction requirement filed on 2/19/03 on the ground(s) that "the Office Action asserts that the combination as claim does not require the particulars of the sub-combination as claimed, and the sub-combination has separate utility. However, this is not the proper test to determine lack of unity of the invention as set forth in 37C.F.R. 1.475 and 1.499. Unity of invention exists only when there is a technical relationship among the claimed inventions involving one or more special technical features. The term "special technical features" is defined as meeting those technical features that define a contribution which each of the inventions considered as a whole, makes over the prior art. See.eg. MPEP 1850. As previously explained in the October 3

amendment, group I and II are directed to a semiconductor device including at least an titanium dioxide semiconductor disposed between a pair of electrodes, the titanium dioxide semiconductor being formed with pores. Thus, because the claims of Group II have a technical relationship involving one or more of the same or corresponding technical features of the claims of Group I, the claims of Group I and II comply with the unity of invention requirements of the IPO." These are not found persuasive because:

a/ The restriction / election requirement in Paper No. 9,11 has been withdrawn due to the examiner's error that the restriction is required under 35 U.S.C. 121 and using the combination and subcombination relationship between inventions I and II. The corrected restriction/election requirement has been set forth below.

b/ Restriction to one of the following inventions is required under 35. U.S.C. 121 and 372.

This application contains claims directed to the following patentably distinct species of the claimed invention.

- I. Claims 1-25,28,30 drawn to a solar cell that does not have the other substrate being arranged at a side of the one substrate that is opposite to the one side and being coated with a reflection film or having a reflection film thereon as recited in claim 26, space being filled with an inert gas including argon gas as recited in claim 27, antireflection film is coated or placed on at least one of the top surface and the bottom surface as recited in claim 29.
- II. Claims 26,27,29, drawn to a solar cell unit having the other substrate being arranged at a side of the one substrate that is opposite to the one side and being coated with a

Art Unit: 2826

reflection film or having a reflection film thereon as recited in claim 26, space being filled with an inert gas including argon gas as recited in claim 27, antireflection film is coated or placed on at least one of the top surface and the bottom surface as recited in claim 29.

c/Additionally, the search is not coextensive as evidenced by the different fields of search for two products.

d/ Since applicant has received an action on the merits for the original presented invention which is group I, claims 1-25,28,30, this invention has been constructively selected by original presentation or prosecution on the merits. Therefore, the election requirement is made final.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 25,28,30 are rejected under 35 U.S.C. 102(b) as being anticipated by Kobayashi et al. (JP-11354169).

With regard to claim 25, Kobayashi et al. discloses a pair of electrodes; and a titanium dioxide semiconductor 15 which is disposed between the electrodes, the titanium dioxide

semiconductor being formed with pores 6; the solar cell being disposed between the first and second substrates. (Note figs. 1,2 of Kobayashi et al.).

With regard to claim 28, Kobayashi et al. discloses at least one of the first and second substrates being arranged at a side from which solar rays enter, the at least one of the first and second substrates being formed into a transparent substrate formed of glass. (Note figs. 1,2 and lines 8 and 9 in paragraph [0008] of the English Translation of Kobayashi et al.).

With regard to claim 30, Kobayashi et al. discloses at least one of the first and second substrates is arranged at the side from which solar rays enter, the at least one of the first and second substrates having a top surface, and a light catalyst made of titanium dioxide is placed on the top surface of the first substrate. (Note figs. 1,2 of Kobayashi et al.).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-8, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saurer et al. (5,482,570) in view of Kobayashi et al. (JP-11354169).

With regard to claim 1, Saurer et al. discloses a pair of electrodes (6,10); and a titanium dioxide semiconductor 14 which is disposed between the electrodes (6,10), the titanium dioxide semiconductor being formed with pores 22, and the titanium dioxide semiconductor 14 being

arranged so as to form a junction J with respect to at least one of the pair of electrodes (6,10). It is inherent that the titanium dioxide semiconductor 14 being arranged so as to form a rectification barrier with respect to at least one of the pair of electrodes (6,10) because rectification barrier is a metal semiconductor junction having the schottky type. (Note lines 54-61, column 2, figs. 3, 5, 8 of Saurer et al.).

Saurer et al. does not disclose the titanium dioxide semiconductor having a fractal structure and defining a surface and an interior.

However, Kobayashi et al. discloses the titanium oxide generally called a titania semiconductor 5 having a pore 6 defining a surface and an interior. (Note fig. 1,2 of Kobayashi et al.)

Therefore, it would have been obvious to one of ordinary skill in the art to form the Saurer et al.'s device having the titanium oxide semiconductor 5 having a pore 6 defining a surface and an interior such as taught by Kobayashi et al. so that the film of TiO_2 can absorb a large molecule as possible with high quality can be offered.

With regard to claim 2, Saurer et al. discloses the rectification barrier is formed by contacting the titanium dioxide semiconductor 14 with at least one of the pair of electrodes (6,10). It would have been obvious to one of ordinary skill in the art to recognize that the rectification barrier has a diode characteristic because the rectification barrier is the shottky barrier that is formed by contacting the titanium dioxide semiconductor with the electrode.

With regard to claim 3, Saurer et al. discloses the rectification barrier is the shottky barrier being formed by contacting the titanium dioxide semiconductor 14 with at least one of the pair of electrodes (6,10). (Note lines 54-61, column 2, figs. 3, 5, 8 of Saurer et al.).

With regard to claim 4, Saurer et al. discloses all claimed invention as in claim 1, except the rectifier barrier is the PN junction being formed by contacting the titanium dioxide semiconductor 14 with at least one of the pair of electrodes (6,10). However, although Saurer et al. and Kobayashi et al. do not teach exact the type of the rectifier barrier as that claimed by Applicant, the type differences are considered obvious design choices and are not patentable unless unobvious or expected results are obtained from these changes. It appears that these changes produce no functional differences and therefore would have been obvious. Note in re Leshin, 125 USPQ 416.

With regard to claim 5, Saurer et al. discloses the electrode 6, with which the titanium dioxide semiconductor 14 forms the rectification barrier, is formed in such a way as to penetrate into the surface of the titanium dioxide semiconductor 14 and the interior thereof. (Note figs. 3, 8 of Saurer et al.).

With regard to claim 6, Kobayashi et al. discloses the film 15 of the titanium oxide makes the ultrafine partical 3 of titanium oxide sinter serves as porosity and has a big specific surface area. Since titanium oxide layer 15 of Kobayashi et al. formed of the anatase type titanium semiconductor that is the same material of applicant's invention, thus it is inherent that they have a porosity in the range of ~~the titanium dioxide semiconductor~~ about 5 to 90 percent. (Note lines 1-7 in paragraph [0003] of the English translation of Kobayashi et al.).

With regard to claims 7 and 8, Saurer et al. and Kobayashi et al. disclose all claimed invention as in claim 1, except for the titanium dioxide semiconductor has a porosity of 15 to 50 and 20 to 40 percent. However, although Saurer et al. and Kobayashi et al. do not teach exact the porosity of the titanium dioxide semiconductor as that claimed by Applicant, the type

differences are considered obvious design choices and are not patentable unless unobvious or expected results are obtained from these changes. It appears that these changes produce no functional differences and therefore would have been obvious. Note in re Leshin, 125 USPQ 416.

With regard to claim 10, Saurer et al. discloses the at least one of the pair of electrodes (6, 10), with which the titanium dioxide semiconductor 14 form the rectification barrier, is formed from a transparent electrode 6 made of ITO. (Note lines 29-35, column 3, figs. 3, 5, 8 of Saurer et al.).

Claims 14-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Saurer et al (5,482,570) in view of Kobayashi et al. (JP-11354169) and further in view of Shiratsuchi et al. (6,084,176).

With regard to claim 14, Saurer et al. and Kobayashi et al. do not disclose the pairs of electrodes are formed by vacuum evaporation.

However, Shiratsuchi et al. disclose the pairs of electrodes are formed by vacuum evaporation. (Note lines 44-51, column 29, fig. 1 of Shiratsuchi et al.).

Therefore, it would have been obvious to one of ordinary skill in the art to form the Saurer et al. and Kobayashi et al.'s the pairs of electrodes are formed by vacuum evaporation such as taught by Shiratsuchi et al. in order to secure the dye-sensitized electrode having the hole transporting layer.

Applicant's claims 15-17 do not distinguish over Saurer et al., Kobayashi et al. and Shiratsuchi et al. references regardless of the process used to form the electrodes and the titanium dioxide semiconductor such as sputtering, printing and subjected to visible rays absorbable processing to enable absorption of visible rays, because only the final product is relevant, not the process of making.

Note that a "product by process" claim is directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); In re Fitzgerald, 205 USPQ 594, 596 (CCPA); In re Marosi et al., 218 USPQ 289 (CAFC); and most recently, In re Thorpe et al., 227 USPQ 964 (CAFC, 1985) all of which make it clear that it is the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that, as here, an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that Applicant has burden of proof in such cases, as the above case law makes clear.

With regard to claim 18, Shiratsuchi et al. discloses organic dye 4 is adsorbed to the titanium dioxide semiconductor 3.

With regard to claims 19, 20, Saurer et al., Kobayashi et al. and Shiratsuchi et al. disclose all the claimed subject matter except for inorganic dye, being adsorbed to the titanium dioxide semiconductor, includes inorganic carbon. However, it would have been obvious to one of ordinary skill in the art to form inorganic dye, being adsorbed to the titanium dioxide semiconductor, includes inorganic carbon, because such structure is conventional in the art for

forming inorganic dye on the titanium dioxide semiconductor. Note lines 44-51, column 29, fig. 1 of Shiratsuchi et al. are cited to support for the well know position.

With regard to claims 21, Saurer et al., Kobayashi et al. and Shiratsuchi et al. disclose all claimed invention as in claim 1, except inorganic dye, being adsorbed to the titanium dioxide semiconductor, includes an inorganic matter obtained by dying carbon. However, although Saurer et al., Kobayashi et al. and Shiratsuchi et al. do not teach exact the type of inorganic dye as that claimed by Applicant, the type differences are considered obvious design choices and are not patentable unless unobvious or expected results are obtained from these changes. It appears that these changes produce no functional differences and therefore would have been obvious. Note in re Leshin, 125 USPQ 416.

With regard to claim 22, Saurer et al., Kobayashi et al. and Shiratsuchi et al. disclose all the claimed subject matter except for the titanium dioxide semiconductor has oxygen defects. However, it would have been obvious to one of ordinary skill in the art to form the titanium dioxide semiconductor has oxygen defects, because such structure is conventional in the art for forming inorganic dye on the titanium dioxide semiconductor in order to create electricity and electron-hole pairs in the particles from absorbed light.

Allowable Subject Matter

5. Claims 11-13, 23-24 are allowable over the prior art of record because none of these references disclose or can be combined to yield the claimed invention such as the pair of electrodes, with which said titanium dioxide semiconductor forms the rectification barrier, includes a solid iodide as recited in claim 11, the pair of electrodes, with which said titanium

dioxide semiconductor forms the rectification barrier, includes copper iodide as recited in claim 12, and the pair of electrodes, with which said titanium dioxide semiconductor forms the rectification barrier, includes silver iodide as recited in claim 13, and the titanium dioxide semiconductor includes impurity that include at least one of Cr and V as recited in claim 23.

Conclusion

6. Any inquiry concerning this communication or earlier communication from the examiner should be directed to Tan Tran whose telephone number is (703) 305-3362. The examiner can normally be reached on M-F 8:30AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (703) 308-6601. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for after final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

TT

Mar 2003


Minh Loan Tran
Primary Examiner